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OVERVIEW: SURFACES, THIN FILMS, AND THERMODYNAMICS

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The section on surfaces, thin films, and thermodynamics of the chemistry and physics of fullerenes continues to be both scientifically stimulating and technologically important. Papers are presented concerning the properties of fullerene thin films, fullerene interactions with surfaces, and the thermodynamics of fullerenes and fullerene derivatives. Two important themes are emerging. First determining the nature and strength of the bonding interaction. Second is the effect of impurities, especially oxygen and solvent, on the properties of fullerene films.

Fullerenes have potential application in xerography, SiC and diamond film growth, optical switching, and protective coatings. In order to predict and control the properties and interactions of fullerenes for these applications, assessing the stability and binding of fullerenes in condensed situations (in thin films and on surfaces) is important. The papers in this section address some of the deficiencies in our understanding of the binding of fullerenes.

Six papers are included in this section. The electrical and optical properties of thin fullerene films and the effects of oxygen impurities are addressed using ellisometry and conductivity measurements in the first two papers. In both the conductivity and ellipsometry measurements the effect of oxygen on the fullerene films seems to be to increase the interband transition energies. This suggests oxygen interaction is removing states, interband or band edge, and/or shifting states to higher energies.

Knudsen cell mass spectroscopy has emerged as a valuable tool to determine heats of sublimation, bond dissociation energies, and reaction enthalpies. The use of solid fullerene mixtures can make the measurements more difficult to interpret, as can cracking of the product ions during impact ionization mass spectrometry. The middle two papers measure the thermodynamic properties of fullerene chlorides and flourides. In addition the fullerene dimers C_{120} and C_{140} are detected.

Measurement of the enthalpy of combustion of C_{60} still proved to be elusive due to toluene impurities, though an important infrared technique for determining toluene content is developed. The role of structural defects in the the kinetics of the structural phase transition at 260 K are demonstrated in the final paper.

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